BUSINESS CRITICAL PROVEN

High Performance Business Intelligence

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HP OpenWarehouse
Business Intelligence

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Agenda

- Industry requirements and trends
  - For large scale data marts and data warehouses
- Delivering and Maintaining High Performing Warehouses
  - Design
  - Operations/Administration
  - Platform
  - Some customer examples
- The HP OpenWarehouse Power Upgrade Program
  - A proven offer designed exclusively for current HP Customers
- Questions and Answers

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Requirements and trends to prepare for

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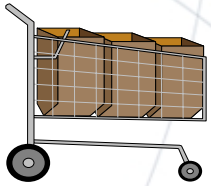
Business Intelligence = Business Success

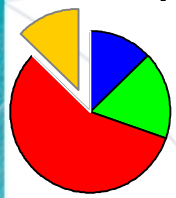
Emerging Applications HP's Customers are Implementing

Customer Relationship Management
- ✔Campaign Mgmt/Database Marketing
- ✔Customer Valuation/Profitability
- ✔Integrated Customer View
- ✔One-to-One Marketing



Call Behavior Analysis
- ✔Service Usage Analysis
- ✔Churn Reduction
- ✔Fraud Detection
- ✔Measure Promotion Effectiveness

Segment Analysis—
Analyze Relationships between:
- ✔Customers
- ✔Accounts
- ✔Products
- ✔Revenues



Risk Management
- ✔Asset & Liability Mgmt
- ✔Market Risk
- ✔Credit Risk

Micro-Merchandising
- ✔Sales Patterns
- ✔Market Basket Analysis
- ✔Vendor Compliance

Performance Monitoring of Profit and/or Revenues by:
- ✔Organization
- ✔Customer
- ✔Product

New Data Warehousing Project Averages 3-Year ROI of 401%

Source: *IDC Special Report: A Study of the Financial Impact of Data Warehousing (199*

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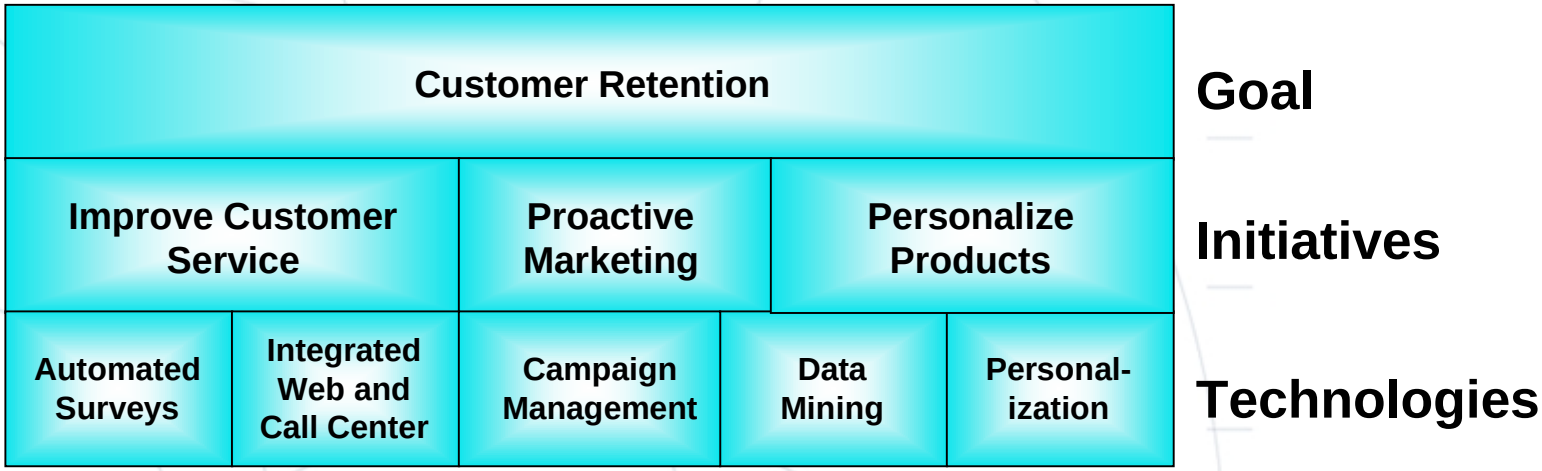
Business Intelligence Demand on the Rise

- Need for strategic business data increasing
- Complex analysis increasing
- Level of detail increasing
- New technology and off-the-shelf BI application increase demands on warehouse resources



Source: GartnerGroup, Data Warehousing—Beyond, 1998

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A Single Version of The Truth Requires Very Detailed Data

Detailed, enterprise-level data is the lowest common denominator to support all downstream information needs.

Provides consistent

- Business Rules
- Allocation algorithms
- Aggregation schemes
- Ability to address unanticipated information requests

Eliminates reconcilement activities resulting from multiple data sources

Results in trust in the information across the

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Target Marketing - Direct Mail:

Old Methodology

- Mass mail millions of pieces to multiple market segments
- Response rate low
- Multiple mailings to same addresses
- High rate of MIS-matched mailings
  - Equity based products to current customers with conservative holdings

New Methodology

- Detailed customer data used to identify non-responders
- Reduce mailings by 2/3
- Maintain volume of positive responses
  - Response rate up dramatically
- Increase number of campaigns

Justification: *10 month payback with mail cost savings*

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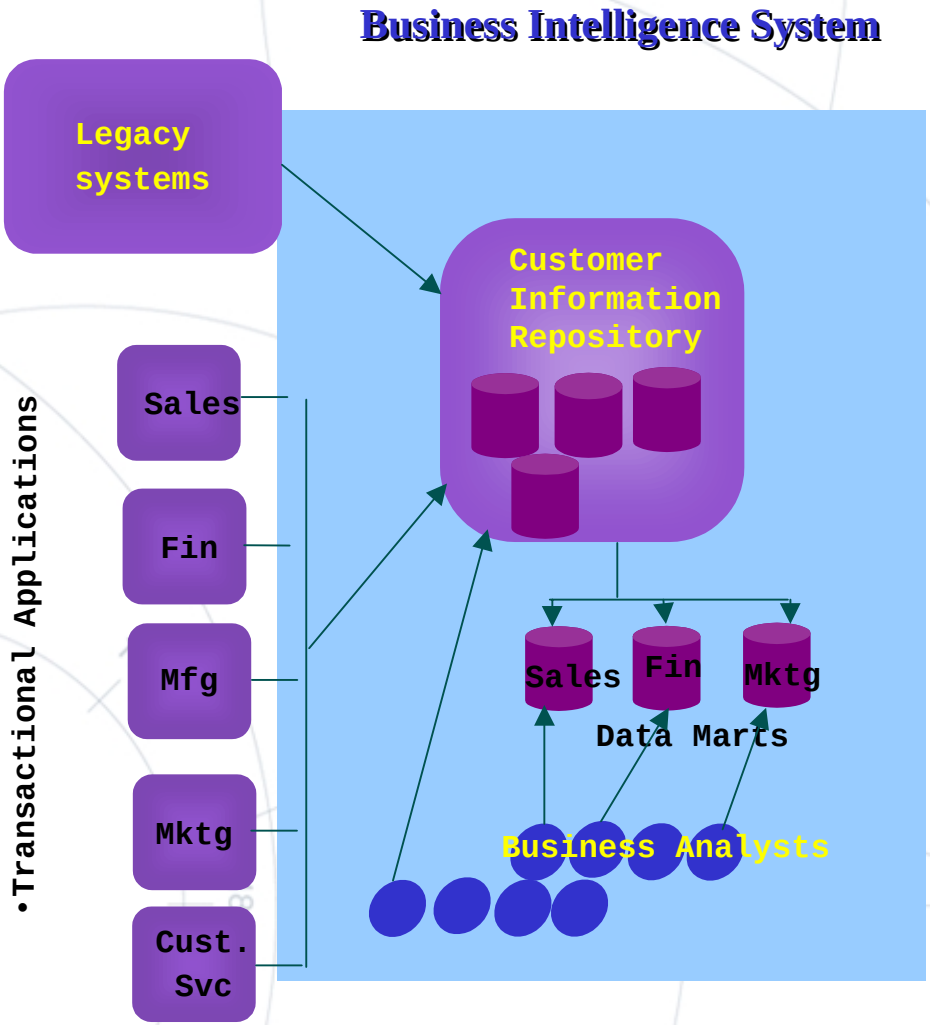
Example: Business Intelligence analysis



Examples BI analysis

Inventory and Product Tu
Call Center average "tal
Average Sales per Rep
Campaign Performance
Product Profitability
Customer Segmentation
Credit Risk
Optimal Product Grouping
High Value Customer Prof

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Most companies plan dramatic BI growth

More users, more data, better levels of information

"Overplan" infrastructure and DW management tools

Source: Meta Group, 1999

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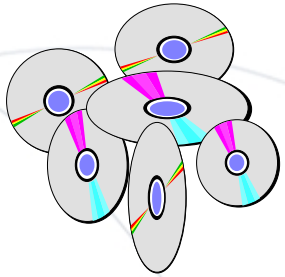
Typical growth factors in high-end data warehousing

The environment is dynamic

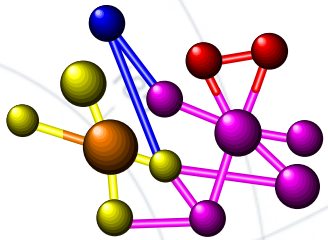
Number of concurrent users increasing

Adding a department, new application, WWW



Amount of detail data increasing

Add subject areas, new applications, more drill-down analysis, more users



Greater complexity of data model, queries

Multi-subject areas, n-way table join

roblem: Queries that used to take minutes now take

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Delivering and maintaining high performing warehouses

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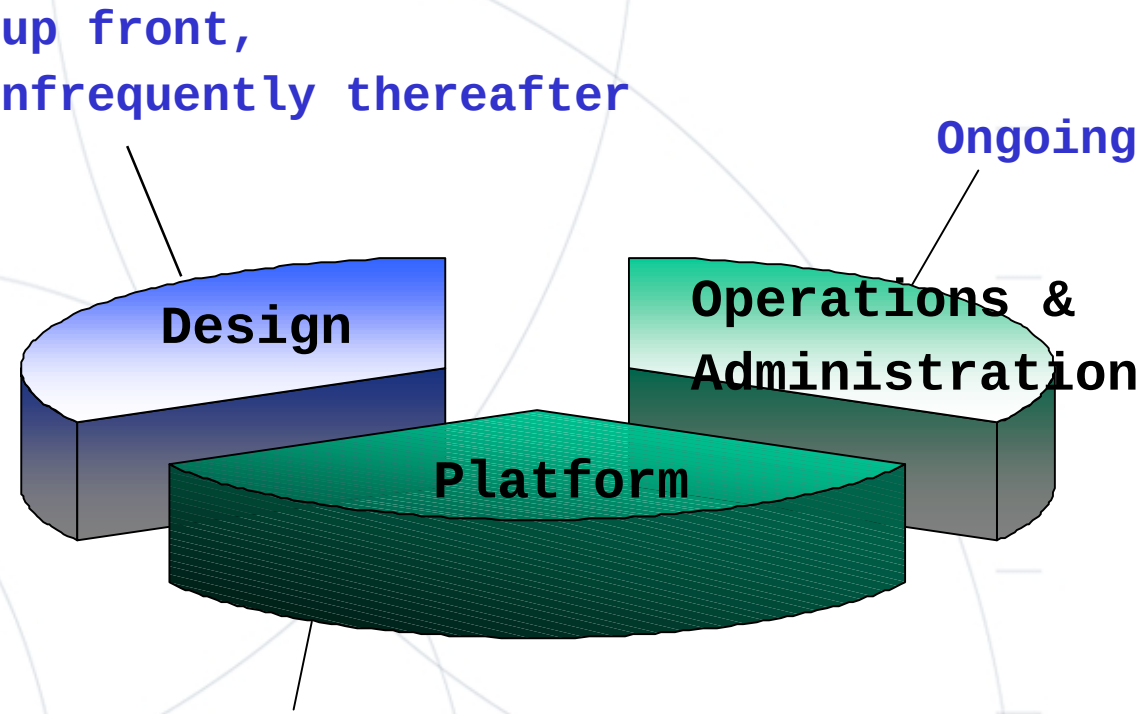
Majors areas that can deliver performance and scalability for Business Intelligence applications



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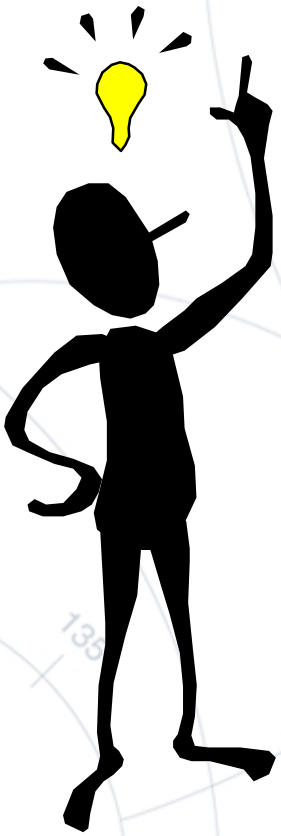
Design of Warehouse and Data Architect



Understand knowledge worker, business analysts, and executive B Intelligence needs

Designs Warehouse architecture including Marts

Works closely with IT to ensure service levels for Business Inte is met

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Typical data architecture design considerations

- Create marts for mining/ad hoc queries
  - Helps reduce intermixing of query types on warehous
  - Useful when there are both operational and ad hoc u
- Star-join schema
  - Design is optimized for dept/group of users with si
  - Useful for “operational” type queries that are run r
- Denormalize (data redundancy, arrays, prejoin tables, aggregat
  - Can save machine cycles for operational queries
- Clustering data
  - Physical location of data is optimized for known qu
  - Can save machine cycles for operational queries
- Compacting data
  - Consider for very stable design, recompacting requir design changes
- Many other areas

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Operational guidelines for Business Intelligence Performance and Scalability

- **Warehouse and Mart Updates**
  - **Update periodically, off-peak, “real-time” only if**
  - **Sequence updates and insertions**
- **Consolidate queries running against same table**
  - **Works for decision support, predictable queries**
  - **DBA determines applicability**
- **Index**
  - **Create data indexes off-peak after data loading**
- **Clean House**
  - **Archive aged, dormant data**
  - **Use nearline storage for less frequently used data**
- **Backup/Storage**
  - **Centralize or network backup**
- **Charge back usage**
  - **Storage, CPU**

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Achieving business intelligence performance and scalability at the platform layer

Can you avoid these typical pressure points?

- Long query queues
- Database processes stacking up
- Ample CPU and RAM but still I/O bound
- More concurrent users accessing the warehouse
- More multi-table joins eating up system resources
- Frequent system memory overflows
- High paging and swapping levels

Yes you can.

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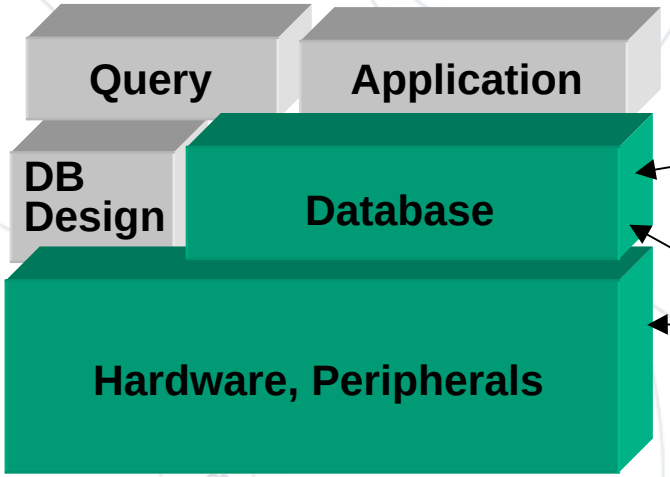
Platform scalability is vital to large-scale business intelligence

Scalable, advance technology for more power and performance

- hardware parallelism - e.g. SMP, Clusters, MPP, NUMA
- database - e.g. parallel queries
- OS features
- system features



- Database optimized for HP-UX 11.x and 64-bit features,
- process queries in parallel
- Systems that support large RAM, I/O, CPU scalability

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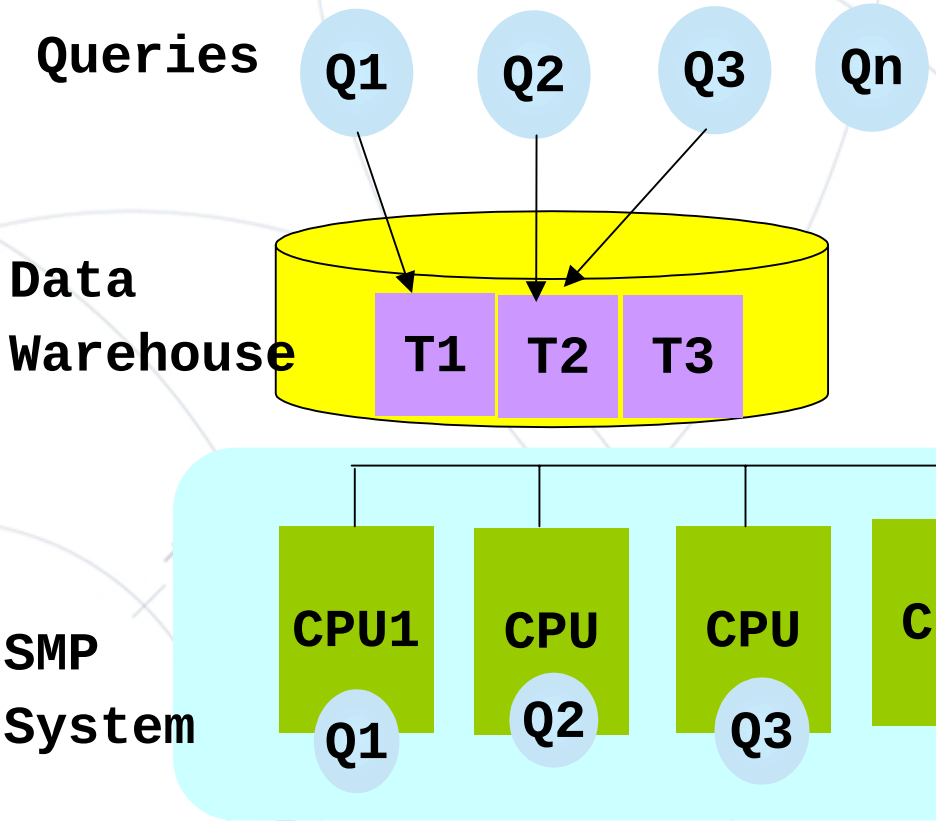
Example: Platform scalability

Supports activities such as:

- Multiple queries
- Complex queries
- Fast backups
- ETL



- Large I/O
- Large Memory
- Large Files
- Large File S
- Expandable C Power

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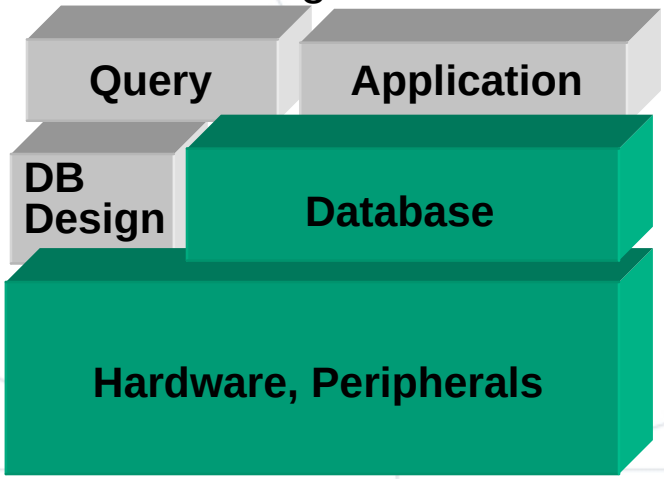
If you've already got a data warehouse

Operations and platform impact performance and scalability

- Significant performance gains can be obtained through a technology upgrade
- Database architecture and query tune-up may be done as a separate activity, often the operational and performance areas offer enough performance
  - New business requirements, entities,
  - Database and query design review for older warehouses
  - New database features requiring structural changes



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HP's scalable Business Intelligence Platform family

Application and System Mgt.

OpenView Express | OpenView Products

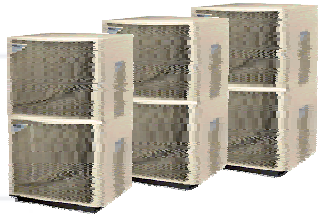
Server Platform











LXR 8000 | LXr 8500 | D-Class | K-Class/ 9xKS | 997 | N-Class | V-Class

HP NetServers | HP 9000 SMP/ HP 3000 Business Servers | SMP with SCA | HyperPlex

Security/Network Management

On-Line Backup and Restore

OmniBack II

E Disk Arrays/ Systems





Disk Array SC10 | Disk System FC10 | Disk Array 12H | Disk Array FC60 | Disk Array XP256

Hierarchical Storage Mgt.

SureStore E SAN Manager DM | OmniStorage (not for NT Servers)

Tape Libraries

Model 1/8 | Model 2/20 | Model 4/40 | Model 6/60 | Model 6/100 | Model 10/588 | Model 20/700

Magneto-Optic Libraries

Model 1/16 | Models 2/32, 4/64, 2/76 | Models 4/128, 4/238, 10/238

Smaller
Data Marts or Warehouses
1-300GB

Medium-Large
Data Marts or Warehouses
1GB - 6TB

Large
Data Marts,Warehouses
3TB - 12TB

Very Large
Data Marts, Warehouses
12TB+

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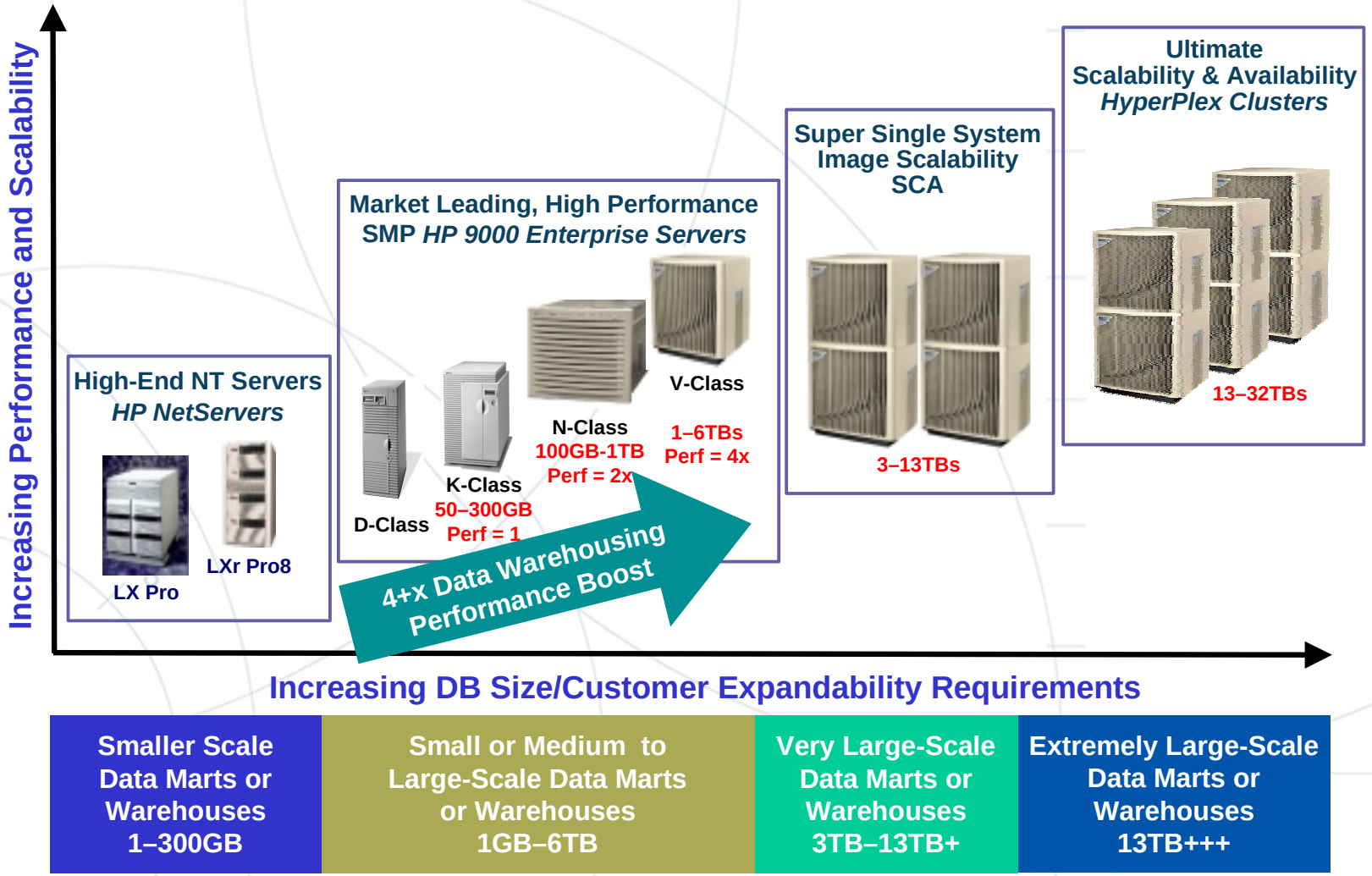
Performance and Scalability

Mainframe-Class Power, Ease of Growth



The HP Technology Advantage

High-End HP 9000 Road Map for Data Warehousing
(Platform = server + database: example below includes Oracle8i performance increases)

Maximum Parallel Scalability: HyperPlex

HyperPlex: Parallel Cluster w/V2250
Up to 16 V2250s
Up to 256 240-MHz CPUs
HyperFabric Interconnect
2 – ~20 TB
Performance = .8X scale factor per node added

HyperPlex: Parallel Cluster w/V2500
Up to 16 V2500s
Up to 512 440-MHz CPUs
HyperFabric Interconnect
5 – ~32 TB
Performance = .8X scale factor per node added

HyperPlex: Parallel Cluster w/V2500 with SCA
Up to 16 128-way V2500s w/SCA
Up to 2048 440-MHz CPUs
HyperFabric Interconnect
13 – ~50 TB++
Performance = .8X scale factor per node added

V2500 Scalable Computing Architecture
Up to 4 V2500s
Up to 128 440-MHz CPUs
3 – 13 TB
Performance = .75X scale factor per node added

Superior Single System Image Scalability: SCA

Excellent SMP Scalability:

V2250
16 240-MHz CPUs
16 GB memory
15.36 GB/s HyperPlane
1.9 GB/s PCI I/O
24 PCI slots
120-MHz System Clock
300 GB – 3 TB
Performance = 1

V2500
32 440-MHz CPUs
32 GB memory
15.36 GB/s HyperPlane
3.8 GB/s 2x PCI I/O
28 PCI slots
240-MHz System Clock
300 GB – 6 TB
Performance = 2.4X

X = Performance improvement relative to the previous system in the road map

1998 **1999** **2000**

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More Power, More Room to Grow

Capability	N-Class	V-Class	Results
Faster, More Scalable CPU	8 440-MHz CPUs	128 440-MHz CPUs	
More Memory	16GB	32–128GB	**Faster Query Processing**
Faster Memory, System Bus	7.6GB/s, 3.8GB/s	15.36–61.44GB/s	
Faster I/O	5.8GB/s peak	1.9–7.6GB/s peak	
HP-UX 11.0x	64-bit	32-bit or 64-bit enabled	**More-Complex Mining**
Performance Leadership	2x	150,000 TPC-D*	
Relative Performance**	12	2–4x	
I/O Slots	2	28	**More Users**
Maximum Internal Disk	71TB	16	
External Mass Storage Connectivity		50–200TB	

* Non-Disclosure 1TB TPC-D, unpublished
** In comparison to K-Class

Single System - SCA

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HP-UX Offers Unique Performance Features

Mature 64-Bit OS	➢ **Larger memory allocation per user and process** ➢ **Larger "in memory" database working sets** ➢ **Larger number of concurrent database users** ➢ **Reduced paging and swapping** ➢ **Large file implementations** ➢ **Large file system implementations**
Fibre Channel	➢ **High-performance link to disks (100MB/s)**
Binary Compatibility	➢ **Investment protection of 32-bit and 64-bit applications, faster time to production**
Great Performance Scaling	➢ **32-way V2500 server provides 7x performance to 64-CPU Sun Solaris server**
Performance Optimized Page Sizing (POPS)	➢ **Application-specific page sizing boosts performance up to 2x!**

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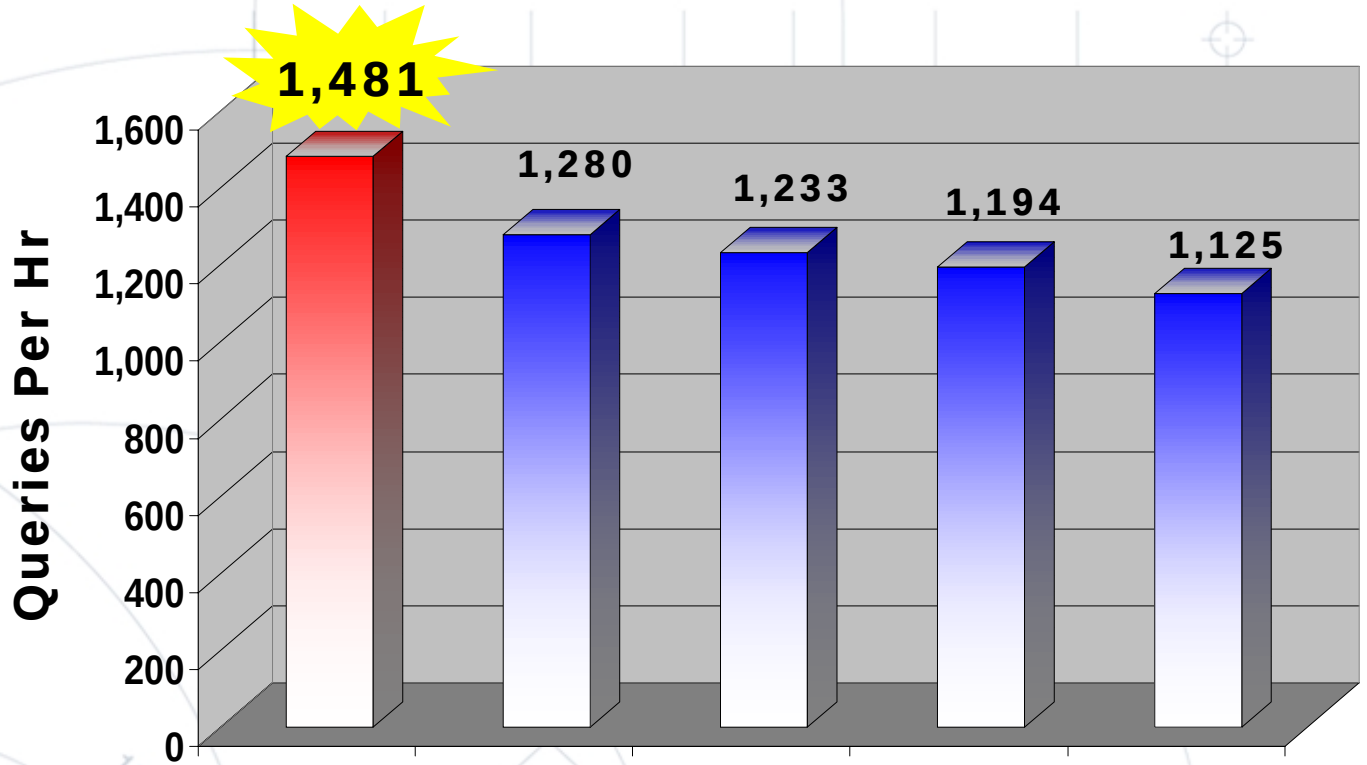
100GB TPC-H - for ad hoc DSS performance

HP posts Leading Business Intelligence Results



	HP N4000 8-way	Sun UE4500 12-way	Unisys ES5085R 8-way	Compaq ProLiant 8-way	HP LXr 8500 8-way
Price/Performance:	$872/QphH	$816/QphH	$288/QphH	$285/QphH	$253/QphH
Database:	Informix	Informix	Microsoft	Microsoft	Microsoft
Availability Date:	12/17/99	11/15/99	04/03/2000	04/03/2000	04/03/2000

As of 10/20/99

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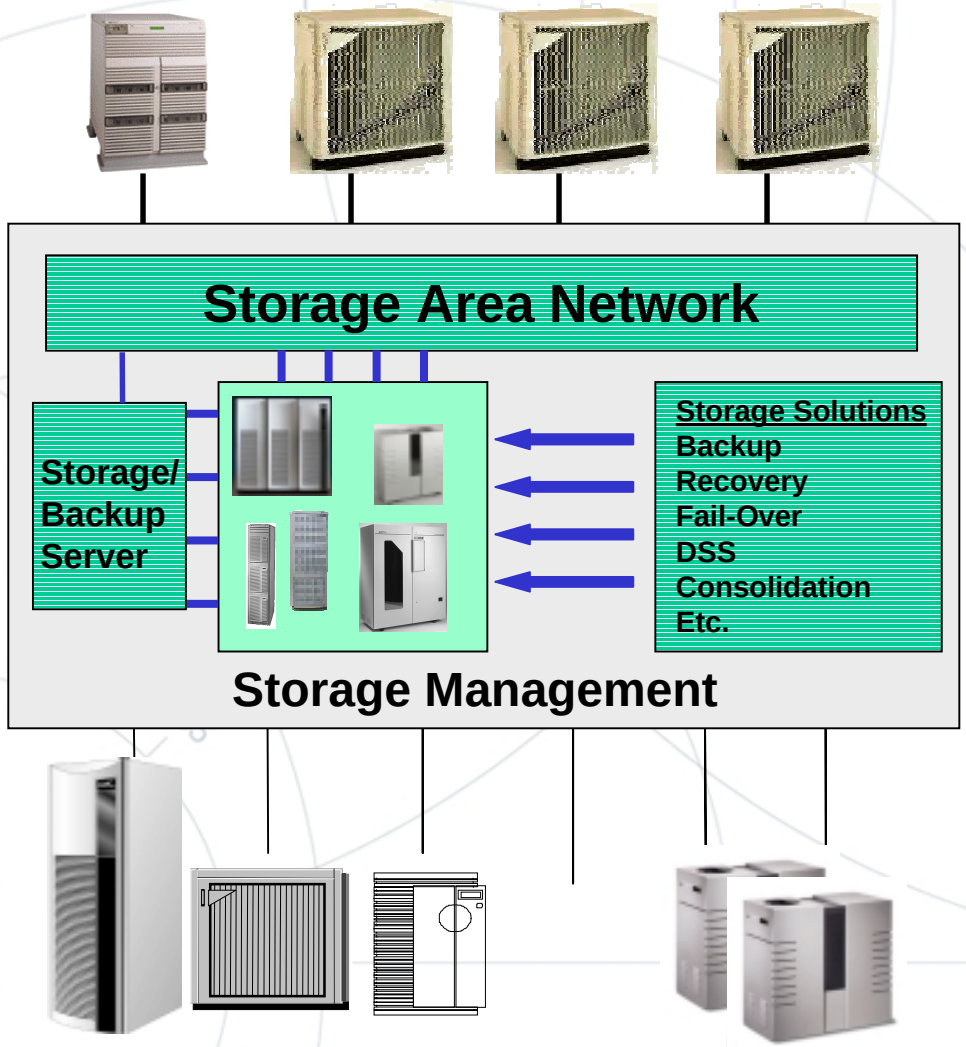
New for Warehousing—"Stress- Free" Storage

Application and Database Servers



Open SAN benefits:

- **Higher availability of systems and storage peripherals**
- **Storage can be added, configured, and serviced dynamically without requiring an interruption to operations**
- **Enhanced data sharing and a new class of fast backup solutions**
- **Greater connection flexibility**

Complete Portfolio of Disk, Tape, and Optical Storage
Leading Provider of Fibre Channel Infrastructures

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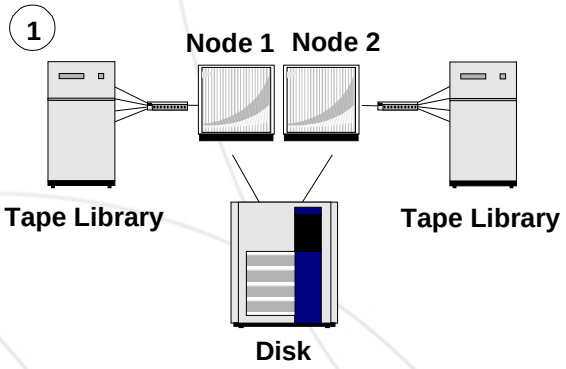
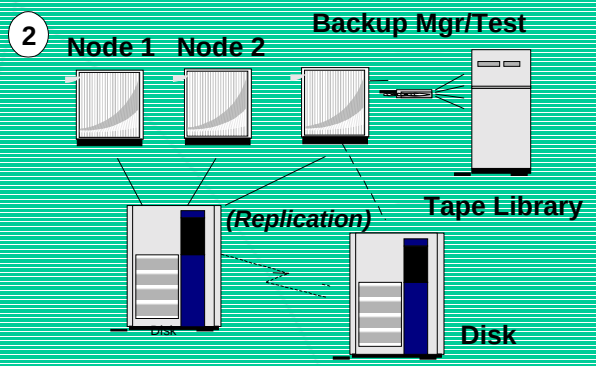
New Storage Architecture Supports Greater Availability and Performance

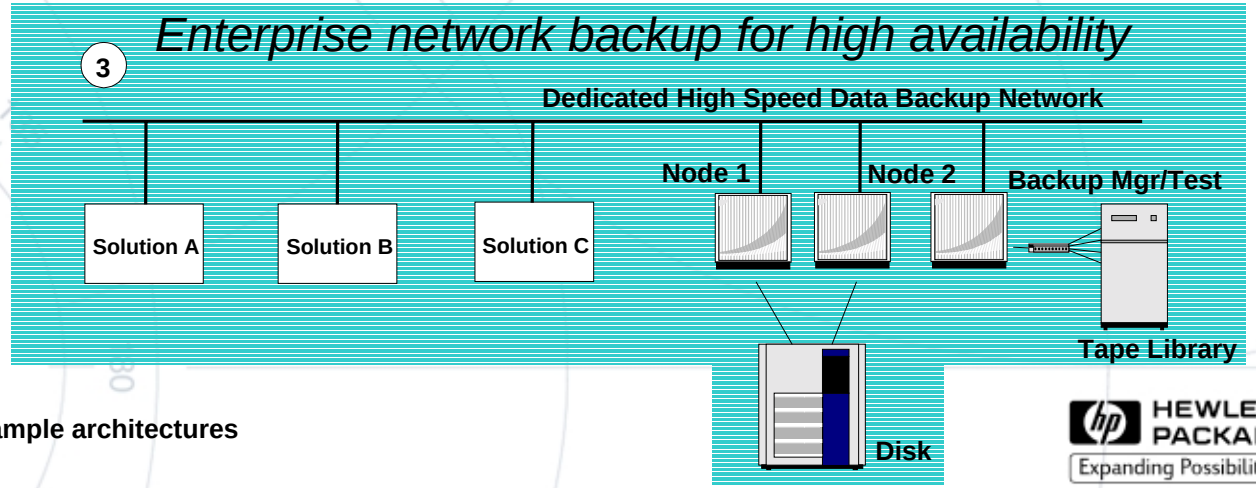
Local backup



Offload host/centralized backup for high availability



Enterprise network backup for high availability



* Sample architectures

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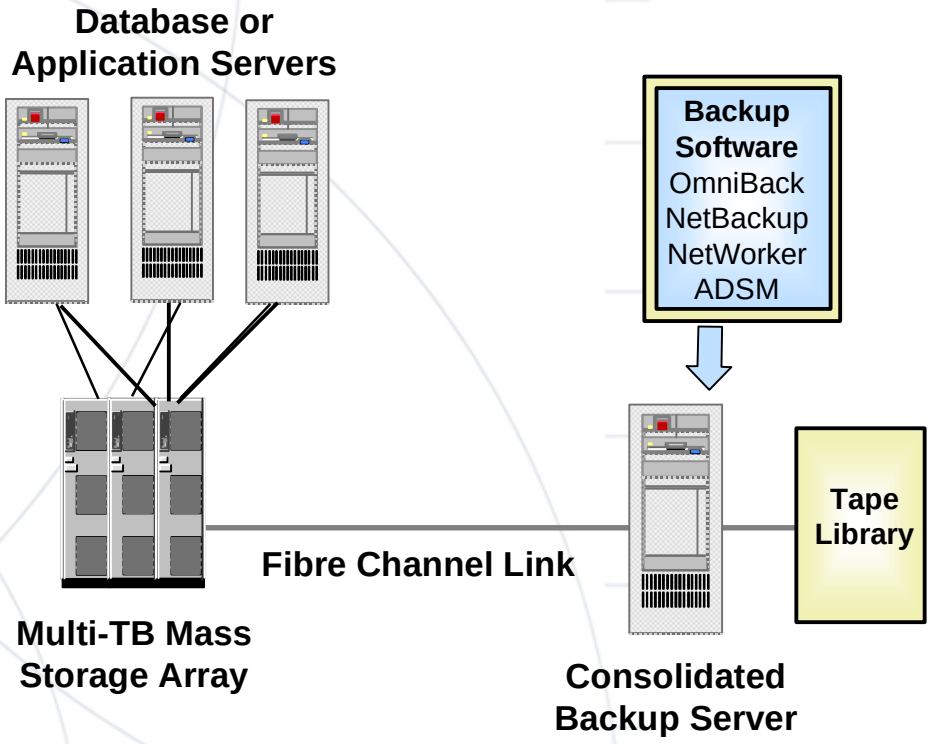
No Downtime Backups

Centralized or Network Backups:

- Single, dedicated backup server
- Consolidated mass storage
- Centralized tape library
- Exploit “split-mirror” backup technology
- Zero impact to production system



Example: HP OmniBack II, EMC TimeFinder, Oracle Online Backup for “Zero” downtime

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Data Warehouse Storage Solutions

New—HP SureStore E Disk Array XP256
For Highest Availability and Flexibility

Non-stop operation with leading-edge systems performance

- **Designed to be Always Up! Always Available!**
- **New generation architecture designed to be a key component in HP's 5nines:5minutes solutions**
- **Choice of server vendors and the broadest platform support in Fibre Channel SAN**
- **Software packages integrated to support centralized management**
- **HP understands servers, SANs, and storage**

- **No single point of failure**
- **No planned downtime**
- **Scalable to 9TB in same subsystem**
- **Broad heterogeneous support**

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Maximum Data Warehousing Uptime

End-to-End Solutions Address Your Needs

- Data and system availability
  - HP MC/ServiceGuard—now with support of 16-node V-Class clusters
  - HP MirrorDisk/UX
  - Online backup and restore
  - Highly available mass storage
  - Disaster-tolerant solutions, including Campus, Metro, and Continental Cluster solutions, integrated with leading data center solutions provide for maximum data warehouse uptime
- Leading mission-critical support services, including the new HP/Oracle Service Integration Program for business-critical information
- 99.95% availability solutions
  - Including key partner technologies and services with Oracle, EMC, and Cisco
- Focused on delivering end-to-end availability through HP's 5nines:5minutes program—99.999% uptime—by year end 2000 for maximum information availability

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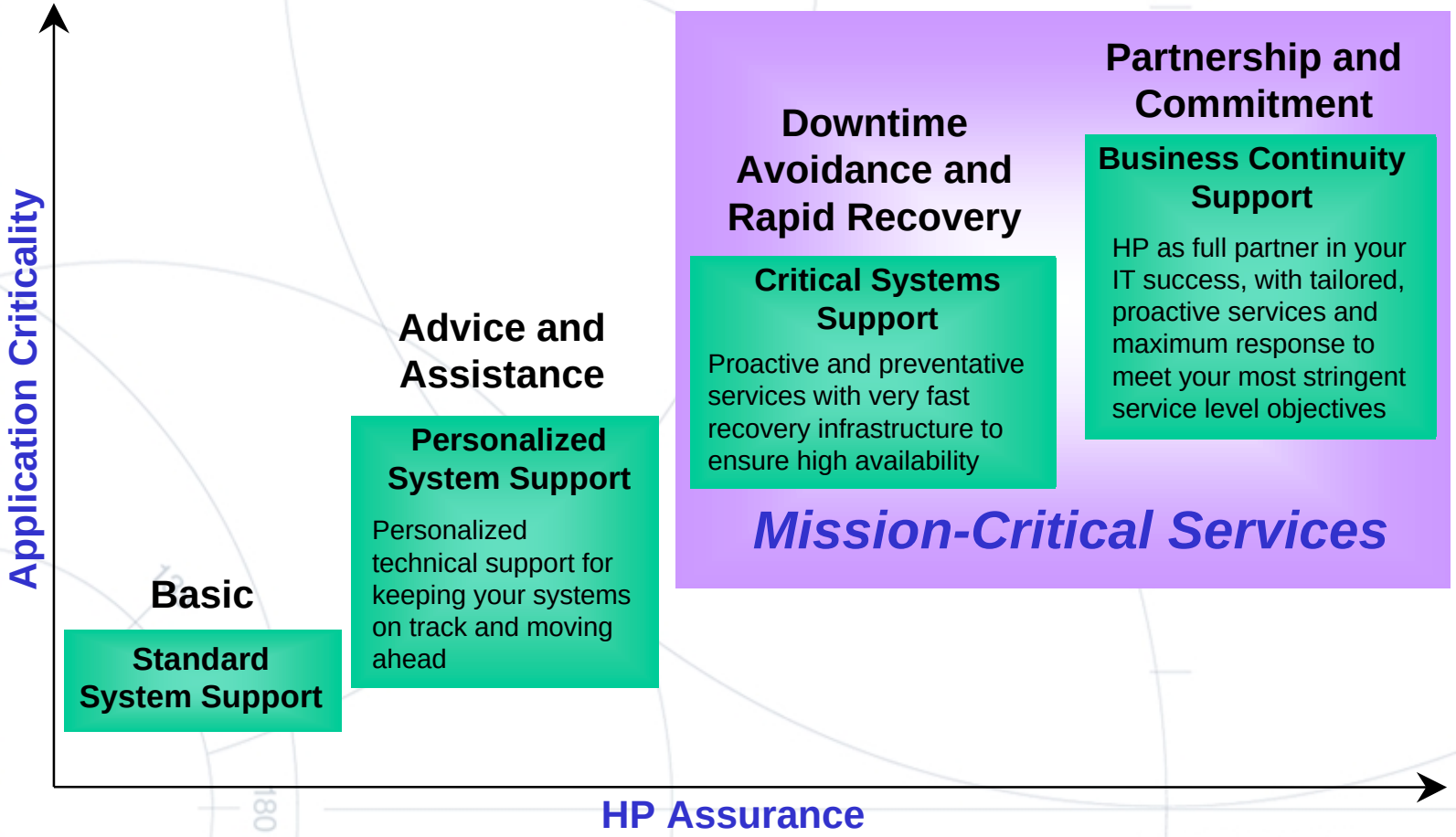
Services and Support for Business Critical Warehousing

HP offers services that meet your growing requirements



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Increasing Warehouse Availability

Online Storage Offerings for High-End Data Warehousing

HP Storage Offering		Customer Priorities
HP SureStore E Disk Array **New: XP256**		• Designed for 100% availability • Scalable to 9TB per subsystem • Supports Open SAN for open storage and connectivity • Easy centralized management • End-to-end solution, service, and support
EMC Symmetrix **New: 3830, 3900**		• High availability—99.95% systems uptime guarantee • High-end scalability to multiple terabytes • High performance • Heterogeneous host connect
HP SureStore E Disk Array—Model 12H		• Ease of use—RAID made easy • High performance • Low cost of ownership • Availability—99.95% systems uptime guarantee

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Maximize Availability with HP OpenView

Proactive Manageability of Data Warehouses

- **HP OpenView for Data Warehouse Manageability**
  - ***Winner*: Data Warehouse Administration, Management and Performance solution**
    - ***DM Review*'s 1998 Readership Awards**
  - **Online backup and online updates**
  - **Centralized administration and control of warehouse resources, tools**

"There were other competitive solutions we looked at, but none was as mature, had the feature or function set or had the market share that HP OpenView did."

– Craig Sword, Product Manager, Alcatel Network Systems

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Some customer examples

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Meet Some HP Business Intelligence Customers

7-Eleven Japan

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Capital One®

Customer Relationship Management

"Capital One performs intensive and sophisticated analyses on billions of pieces of data, and HP's reliable performance enables us to reach the people we want with highly individualized solicitations . . . HP is a key component of Capital One's successful information-based strategy."

John Pastore
Infrastructure Technology Manager

Business

- 9th largest bank card company
- 13.6 million customers; 15 billion managed loans

Business Objectives

- Quickly identify profitable credit card customers and target through predictive prospecting
- Use information-based technology to reduce time to market
- Manage a recent doubling of growth in business with more powerful computing
- Control risk at the individual account level

Solution

- Rapid implementation of data warehouse
- SAS data mining solution for customer profiling and targeted marketing
- Two HP 9000 Enterprise Servers (T-500)
- 1TB Oracle database

Benefits

- Faster delivery of product marketing materials to a more accurate, targeted customer base
- Improved risk management at the individual account level
- 20% return on equity; 40% average account growth

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Westpac

AUSTRALIA'S FIRST BANK

Customer Relationship Management

"It came down to depth of experience and breadth of capabilities. We expected a lot of them, and HP was demonstrably able to come up with the goods, particularly in conjunction with Oracle. Their involvement with Intel in developing the architecture for the next generation (IA64) chip helped tip the balance in their favour too."

David Street
Manager of Decision Support
Westpac

Business

- 3rd largest bank in Australia
  - AU$130BN assets, AU$1.3BN profit
- 4 million active retail customers in Australia, with 7 million accounts
- Retail operations in Australia, New Zealand, and Pacific Islands

Business Objectives

- More targeted, effective marketing campaigns
- Profitability analysis by understanding what channels customers are using and how often
- To accommodate the new loads of data from current and future acquisitions

Solution

- HP V2200 Server
- Oracle8*i* database
- Over 2TBs of EMC storage
- Intelligent Warehouse (previously HP, now PLATINUM)

Benefits

- Brought marketing campaign work in-house, which saved "a bundle"
- More targeted, focused marketing, resulting in "dramatically improved" response rates
- A product strategy that offers scalability to meet their ever-growing user and data demands, protecting the investment

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7-Eleven Japan: Targeted Marketing and Near Real-Time Inventory Management

oh thank heaven.

"HP has been a partner for our data warehouse for a number of years now. We have been impressed with HP's commitment to our success by ensuring we perform optimally to meet our ever increasing users' demands and amounts of data. With over 10TBs on our current HP V-Class Enterprise Server running an Oracle Database along with HP's new V-Class technology being introduced, we are very enthused about 7-Eleven Japan Co., Ltd. continuing to grow with HP at the multi-TB level"

Makoto Usui
Director & General Manager
Information System
7-Eleven Japan Co., Ltd.

Business

- 7,300 stores nationwide
- Stocking more than 3,500 different products
- Over 5 million customers per day

Business Objectives

- To increase sales, enhance marketing campaign effectiveness, and reduce inventory management costs
- Identify and analyze hot-selling products, dead-end products, and the most effective ways to display merchandise
- Understand past sales trends
- Understand what items were sold together

Solution

- Enterprise-Wide Data Warehouse on HP 9000 V2250 running an Oracle8 database with 4TBs of data
- 10TBs total EMC disk for continued growth
- Data mining
- Five HP 9000 Model K460 distributed servers
- 225+ HP NetServers accessing the K460s

Benefits

- Cut daily deliveries per store
- Ensured supply adequate to demand for products
- Fast, accurate sales projections to maintain leadership position in market
- Headquarters analysts view daily sales and inventory trends the following day—instead of 17 days later

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HP's internal Express2 Information Model

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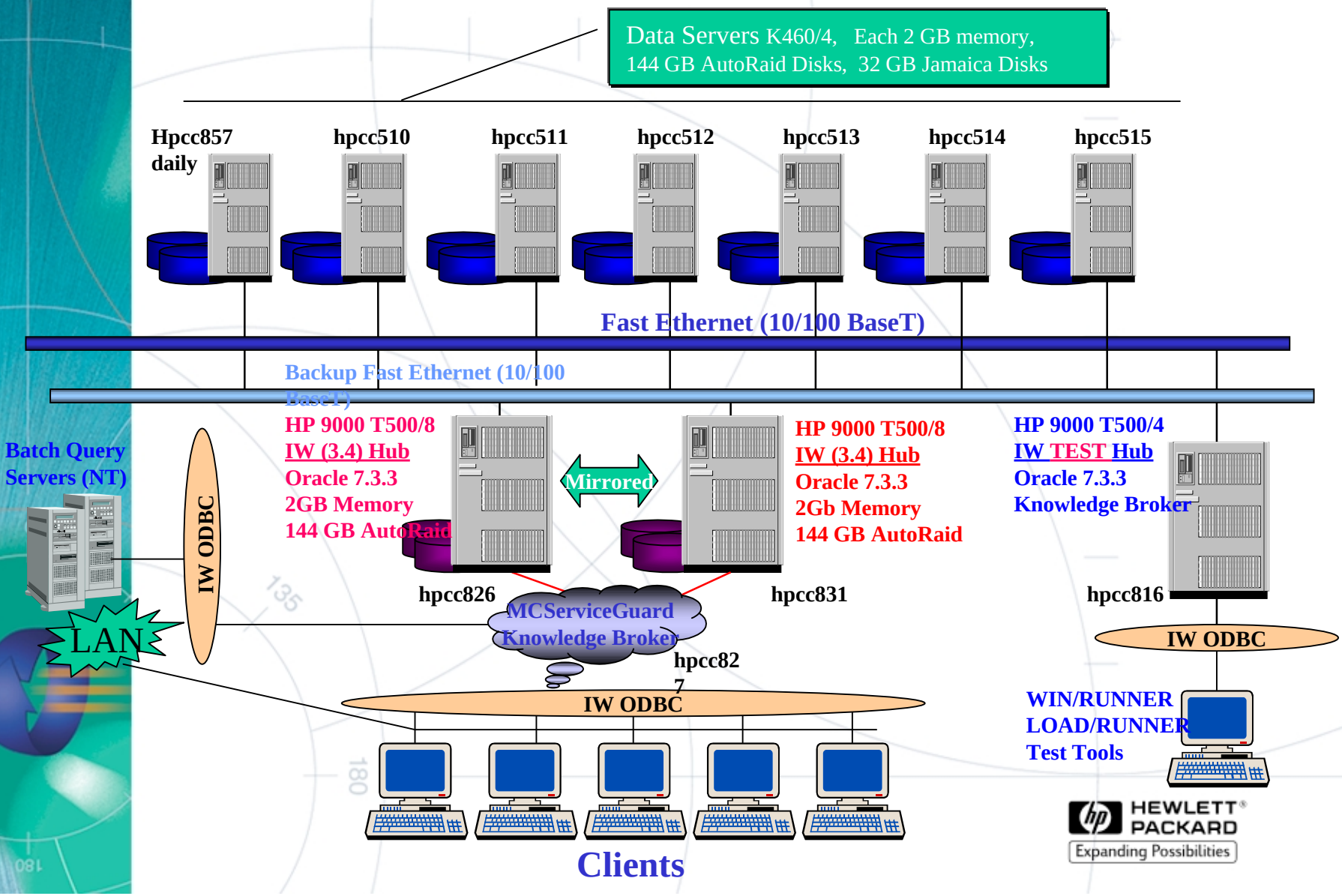
HP's Xpress2 - Architecture - 1998



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HP's Xpress2 facts & figures as of 1998

Now based on open systems for lower operati
scalable technology using solutions from HP

Amount of Online Data	600+ GB/5 Yrs History + Current FY
Number of Tables	500+
Number of Users	2,500 Worldwide
Queries at Month End	7,000+
Queries per Month	45,000+
Updates per Day	Multiple

Major improvements compared to Xpress1 (<250GB, few users

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BUSINESS CRITICAL PROVEN

HP OpenWarehouse Power Upgrade Program

Selecting the optimal warehousing architecture

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HP OpenWarehouse Power Upgrade Program

An Optimized Data Mart and Data Warehouse Solution

- For HP Customers Using HP Systems for Data Mart and Data Warehousing applications
- Who need to upgrade existing HP systems for increased performance, capacity and scalability
- To support large-scale functional and enterprise data marts and data warehouses

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How You Know You Need a Power Upgrade

- Your databases are growing into the terabyte range
- Queries take longer than your lunch hour
- You want to add more knowledge workers
- More-advanced data mining is needed
- You want to manage it all easily
- Lower TCO and higher ROI are a priority
- Current warehouse does not provide enough answers
- You are planning to add more Business Intelligence
  Analytic Applications . . .

Power Upgrade Program—

Delivers the Power and Performance

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Power Upgrade Assessment Service

Determining the Optimal Warehousing Architecture

How much performance will I get by upgrading to a newer Warehousing platform?

What specific technology will provide the performance and scalability that I need?

What solutions meet my warehouse availability objectives?

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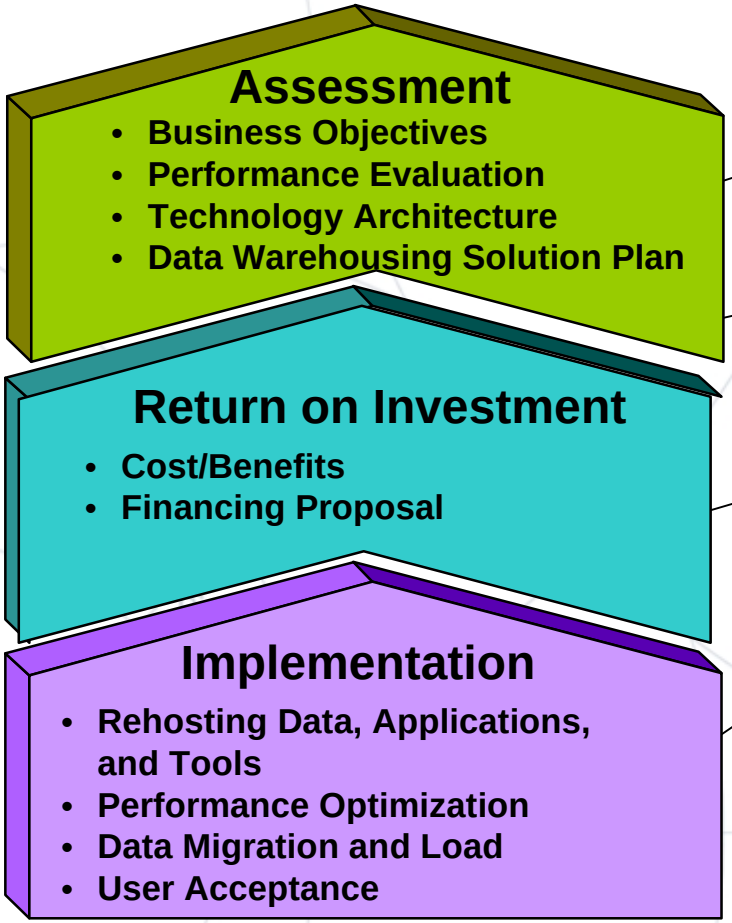
HP OpenWarehouse Power Upgrade Overview

Focus on technology enhancements that support large-scale Business Intelligence needs



- **No charge for basic assessment**
- **Custom "blueprint" speeds results**
- **Speeds warehouse upgrade justification**
- **Total implementation management**

* engineering time

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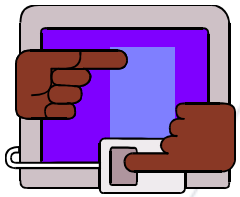
Power Upgrade Assessment Service

Focus on key technology areas for optimal warehousing performance, scalability, and availability

Business Goals

Technical Goals



Technical Architecture, Performance/Capacity Study

Data Warehouse Solution Plan

- **Technical and System Architecture**
- **IT Process Implementation**
- **Consulting Services**
- **Support Services**
- **Implementation Plan**

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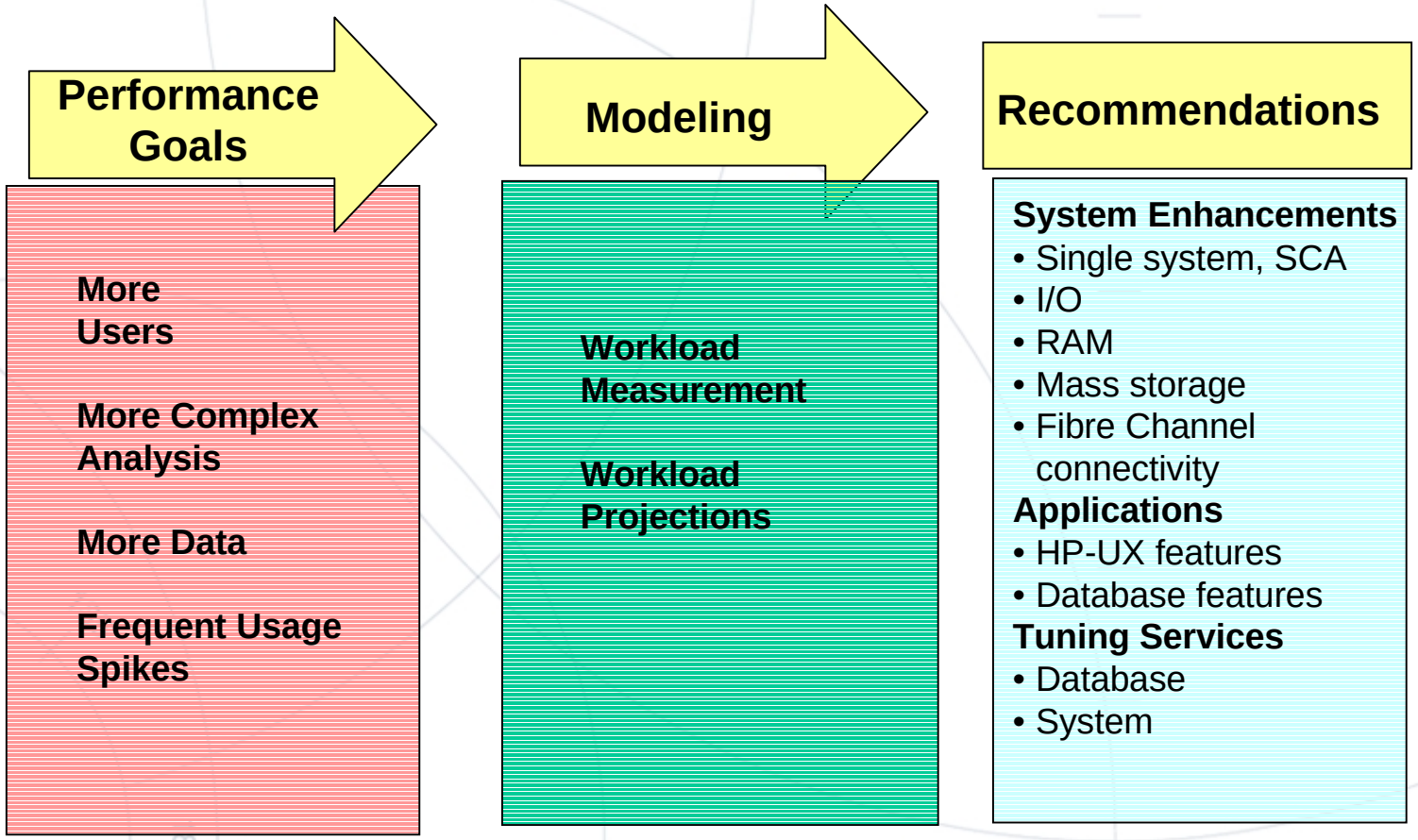
Power Upgrade Assessment Service

Assessment of current and future warehouse capacity



Modeling is based on a technical questionnaire or data collection from your system

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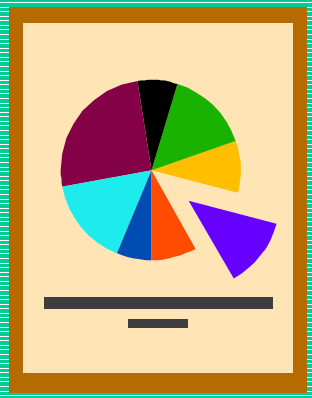
Power Upgrade ROI Service

Helps you justify the enhancements to the warehouse environment

Benefits
- **Targeted marketing**
- **Reduced inventory**
- **Cross selling**
- **Customer loyalty**
- **More knowledge workers**
- **More executive access**

Cost Savings
- **Storage consolidation**
- **Warehouse consolidation**

Investment
- **System**
- **Infrastructure**
- **Availability**
- **Financing**
- **Support**
- **Maintenance**
- **Staffing**
- **Implementation**



More performance and capacity for more users, more complex uses of the warehouse

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Power Upgrade Implementation Services

Activities

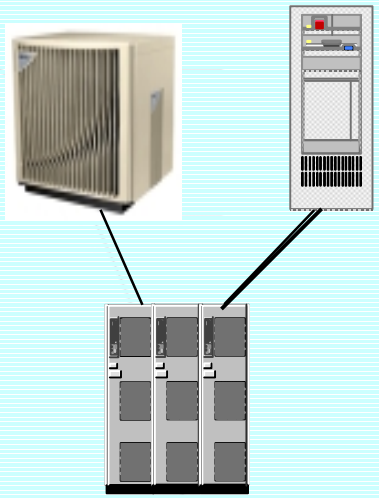
- Rehost Apps,
- Data, Tools
- Data Migration
- Database and System Tuning
- User Acceptance

- System Availability
- Networking
- Mass Storage

Technology

Optimized Warehouse Performance

Enhanced Warehouse Architecture



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Let the Power Upgrade Program Work for You
Special offer to HP customers

- **Free Data Warehouse Upgrade Architecture Plan**
- **Fast return on investment**
- **Up to 4 times performance increase**

SYNECTICS SOLUTIONS

TANNING Technology Corporation

SYSIX TECHNOLOGIES
Our People Are The Solution.

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Promotions

Informix	I-Spy special discount for HP customers
SYBASE	Server IQ speeds ad hoc queries
HP TradeUP	Bigger Tradeup to HP 9000 V and N Class

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The HP Experience Advantage

Ensures That Your HP OpenWarehouse Implementation Continues to Deliver Results

- Experience
  - More than 700 data warehouse installations on HP
  - More than 35 1TB+ installations
  - Resulted in the HP Data Warehouse Advanced Technology Center
- Leadership
  - HP Wins Data Warehousing Institute 1998 Best Practices Award—Data Quality Category
  - HP Helps Quantum Win Data Warehousing Institute 1998 Best Practices Award—Meta Data Management Category
  - Exclusive High Availability Services with Oracle, EMC, and others
  - #1 UNIX data warehouse platform—META Group (1995, 1996, 1997, 1998)
  - #1 platform for large-scale data warehouses—GartnerGroup (1998)
- Commitment
  - Helping customers leverage HP's long-term

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Let HP and our partners help you Power Upgrade.

Contact your local HP representative

- For additional technical information:
  - www.hp.com/go/businessintelligence
  - Inmon, Bill, and Rudin, Ken, and Buss, Christo and Sousa, Ryan, *Data Warehouse Performance.* John Wiley & Sons, Inc., 1999.

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